

AMENDMENTS TO THE CLAIMS:

This listing of claims replaces all prior versions and listings of claims in the application:

LISTING OF THE CLAIMS:

1. (Currently Amended) A data transmission apparatus ~~used for use~~ in a multiple service ring ~~including~~ comprising at least two nodes ~~coupled~~ electrically connected to at least one aggregate pipe and to at least one tributary, said data transmission apparatus comprising:

a tributary receiving (RX) framer ~~coupled~~ electrically connected to a tributary, the tributary RX framer for deframing data frames received from said tributary and for extracting a destination node addresses from received data frames ~~address~~;

a transmitting (TX) framer for encapsulating ~~the~~ destination node ~~address~~ addresses and ~~the~~ data received from the tributary into data frames ~~of~~ for the multiple service ring and for transmitting the ~~same~~ data frames for the multiple service ring along an aggregate pipe to a downstream neighbor node in the multiple service ring;

a RX framer for receiving, and for deframing, data frames ~~of~~ from the multiple service ring from ~~a~~ an upstream neighbor node along an aggregate pipe of the multiple service ring to obtain at least a destination node addresses ~~address~~ and ~~actual~~ data;

a filter for determining data frames for a local node ~~according to~~ based on at least one obtained ~~the~~ destination node address, and for forwarding ~~the~~ other data frames that are not for

the local node to said TX framer so as to forward ~~the other frames to a next~~ another node of the multiple service ring;

a tributary TX framer for encapsulating ~~said~~ data frames for the local node into tributary data frames and for sending the tributary data frames to a corresponding tributary;

wherein ~~each~~ at least one aggregate pipe ~~comprises a~~ in the multiple service ring has an N-ring structure comprised consisting of N-M unidirectional ringlets and M unidirectional counter-rotating ringlets, where N and M are integers and $1 \leq M < N$; and

a ring management unit for controlling use of ringlets in the at least one aggregate pipe, wherein controlling use of ringlets comprises assigning an (n-1)-th ringlet to transport data packets in a unidirectional direction and an n-th ringlet to transport control packets in a direction opposite to the unidirectional direction, where $1 < n \leq N$.

2 and 3. (Canceled)

4. (Currently Amended) The data transmission apparatus according to claim 1 ~~[[3]]~~, wherein said n-th ringlet ~~as a control channel of (n-1) ringlet comprises is also set default as a protection channel of for the (n-1)th ringlet in the case of fibre facility failure of, or signal degradation of, the (n-1)th ringlet.~~

5. (Currently Amended) The data transmission apparatus according to claim 1, further comprising ~~a tributary identifier setting-up~~ means for setting-up an identifier for use in

~~identifying an~~ indicating the originating tributary, and said wherein the tributary identifier are is
encapsulated ~~together with the~~ a destination node address and the data received from the
tributary ~~into in at least one data frame for frames of the multiple service ring.~~

6. (Currently Amended) The data transmission apparatus according to claim 5, further
comprising ~~a tributary determining means for determining the~~ a tributary type and a tributary No.
number from at least one of the data frames for a local node, so as to send said for use in sending
tributary data frames to ~~a~~ the corresponding tributary.

7. (Currently Amended) The data transmission apparatus according to claim 6, wherein
~~said data frames of the MSR~~ multiple service ring comprise ~~are~~ FE/GE/10GE MAC frames.

8. (Currently Amended) The data transmission apparatus according to claim 7, further
comprising a CWDM/DWDM (Coarse Wavelength Division Multiplex/ Dense Wavelength
Division Multiplex) unit for ~~transmission of~~ transmitting multiple aggregates, wherein:

for the CWDM, ~~the~~ an aggregate will be comprises FEs, ~~GEs~~ FE, GE and 10GE frames,
~~and be operated where~~ at N=4, 8, or 16 ~~4/8/16; and~~

for the DWDM, ~~the aggregate is~~ an aggregate comprises 10GE frames ~~with~~ using Wide
Interface sublayer – SONET (Synchronous Optical Network) transmission, or ~~using~~ comprises
GE and FE frames using an STM-16/OC-48 channel (into DWDM) in which STM-16/OC-48

~~carries GEs and FEs, and ringlet number, wherein, for DWDM, N[[,]] can be up to~~ is at most
1024.

9. (Canceled)

10. (Currently Amended) The data transmission apparatus according to claim 1, wherein
~~each aggregate pipe includes pipes in the multiple service ring comprise~~ link and broadcast
topologies.

11. (Currently Amended) A data transmission method used ~~in~~ with a multiple service
ring ~~including that comprises~~ at least two nodes ~~coupled~~ electrically connected to at least one
aggregate pipe and to at least one tributary, said method comprising: ~~the steps of:~~

(A) for data frames from a tributary: [[,]]

receiving ~~and~~ the data frames from the tributary;

deframing data frames received from said tributary; ~~and~~

extracting a destination node addresses from received data frames
~~address; and~~

encapsulating the extracted destination node ~~address~~ addresses and
~~the data received from the tributary into~~ data frames of for the multiple
service ring; and

transmitting the ~~same~~ data frames for the multiple service ring
along an aggregate pipe to a downstream neighbor node in the multiple
service ring; and

and (B) for data frames from a ~~upstream~~ neighbor node that is upstream along an
aggregate pipe in the multiple service ring;[[,]]

receiving data frames from the upstream neighbor node;

~~and~~ deframing received data frames ~~of the multiple service ring~~
~~from the upstream neighbor node along the aggregate pipe~~ to obtain at
least a destination node ~~address~~ addresses and ~~actual~~ data;

determining data frames for a local node ~~according to~~ based on at
least one obtained ~~the~~ destination node address; ~~and~~

forwarding ~~the~~ other data frames that are not for the local node to a
~~next~~ another node of the multiple service ring; and

encapsulating ~~said~~ data frames for the local node into tributary data
frames; and

sending the tributary data frames to a corresponding tributary;[[,]]

wherein ~~each~~ at least one aggregate pipe in the multiple service ring has an ~~comprises a~~
N-ring structure ~~consisting~~ comprised of N-M unidirectional ringlets and M unidirectional
counter-rotating ringlets, where N and M are integers and $1 \leq M < N$; and

wherein the method further comprises controlling use of ringlets in the at least one
aggregate pipe, wherein controlling use of ringlets comprises assigning an (n-1)-th ringlet to

transport data packets in a unidirectional direction and an n-th ringlet to transport control packets in a direction opposite to the unidirectional direction, where $1 < n \leq N$.

12 and 13. (Canceled)

14. (Currently Amended) The data transmission method according to claim 11 ~~13~~, wherein said n-th ringlet ~~as a control channel of (n-1) ringlet is also set default as~~ comprises a protection channel ~~of for the (n-1)th ringlet in the case of fibre facility failure of, or signal degradation of, the (n-1)th ringlet.~~

15. (Currently Amended) The data transmission method according to claim 11, wherein, for data frames from the a neighbor node that is upstream ~~neighbor node~~, said method further comprises:

~~the step of~~ setting-up an identifier for ~~indicating the use in identifying an~~ originating tributary, ~~and wherein said tributary~~ the identifier ~~are~~ is encapsulated ~~together with a the~~ destination node address and ~~the data received from the tributary into frames in at least one data~~ frame of the multiple service ring.

16. (Currently Amended) The data transmission method according to claim 15, further comprising ~~a step of~~ determining ~~the~~ a tributary type and tributary ~~No.~~ number from at least one

of the data frames for a local node, so as to send said for use in sending tributary data frames to a
~~the~~ corresponding tributary.

17. (Currently Amended) The data transmission method according to claim 16, wherein
~~said data frames of the MSR are~~ multiple service ring comprise FE/GE/10GE MAC frames.

18. (Currently Amended) The data transmission method according to claim 17, wherein
multiple aggregates are transmitted using ~~used for~~ CWDM/DWDM (Coarse Wavelength
Division Multiplex/ Dense Wavelength Division Multiplex), wherein:

for ~~the~~ CWDM, ~~the an aggregate will be~~ FEs, GEs comprises FE, GE, and 10GE frames,
~~and be operated at~~ where N=4, 8 or 16 ~~4/8/16~~; and

for ~~the~~ DWDM, ~~the an aggregate is~~ comprises 10GE frames using ~~with~~ Wide Interface
sublayer- SONET (Synchronous Optical Network) transmission, or using comprises GE and FR
frames using an STM-16/OC-48 channel (~~into DWDM~~) in which ~~STM-16/OC-48 carries~~ GEs
~~and FEs, and ringlet number~~, wherein, for DWDM, N, can be up to is at most 1024.

19. (Canceled)

20. (Currently Amended) The data transmission method according to claim 11, wherein
~~each aggregate pipe includes~~ pipes in the multiple service ring comprise link and broadcast
topologies.

21. (Currently Amended) The data transmission apparatus according to claim 1 [[3]], wherein one of the N ringlets ~~is set as~~ comprises a protection channel for ~~the other~~ at least one other of the N ringlets.

22. (Currently Amended) The data transmission method according to claim 11 [[13]], wherein one of the N ringlets ~~is set as~~ comprises a protection channel for ~~the other~~ at least one other of the N ringlets.